晶采光電科技股份有限公司
AMPIRE CO., LTD.

Specifications for LCD module

Customer	
Customer part no.	
Ampire part no.	**AM-1920720FTZQW-00H**
Approved by	
Date	

☑ **Preliminary Specification**
☐ **Formal Specification**

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*This specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2025/05/13	--	New Release	Mark

1.0 General Descriptions

1.1 Introduction

The LCM is a color active matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) module that uses amorphous silicon TFT as an active switching device. This module has a 10.25 inch diagonally measured active area with FHD resolutions (1920 horizontal by 720 vertical pixel array).

1.2 Features

- LVDS interface
- Wide View Angle
- LVDS Single Channel
- RoHS Compliant
- LCD Driver IC: FL5896*1 & FL5101*2

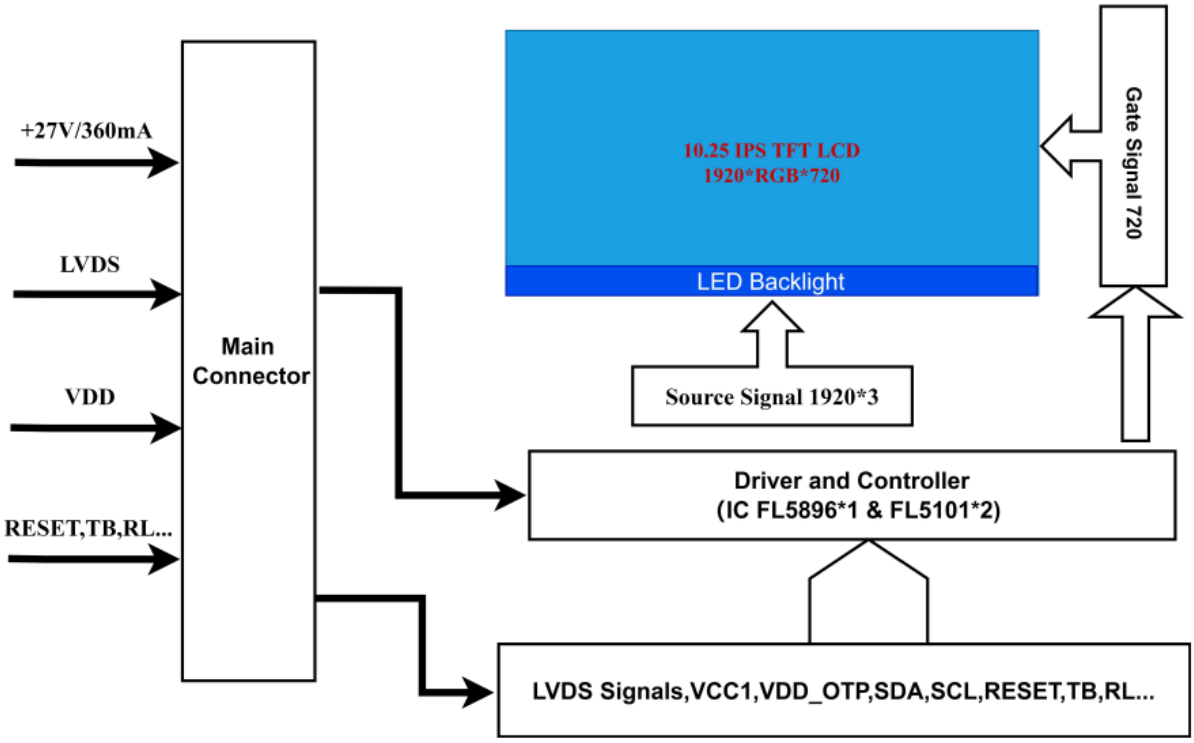
1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	10.25	Inch
Active Area	243.65 (H) × 91.37 (V)	mm
Pixel Format	1920 (H) x RGB x 720 (V)	-
Pixel Pitch	0.1269 (H) X 0.1269 (V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	1050 (Typ.)	cd /m2
Contrast Ratio	1300 : 1 (Typ.)	-
Support Color	16.7M	-
Electrical Interface	LVDS	
NTSC	75	%
Surface Treatment	HC	

1.4 Functional Block Diagram

The functional block diagram of the LCD module is shown below.

Figure 1 Block Diagram



2.0 Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Logic Supply Voltage	VDD	-0.3	3.6	V	
Digital I/O Voltage	VDDIO	-0.3	3.6	V	
Operation Temperature	TOP	-30	85	℃	
Storage Temperature	TST	-40	90	℃	

Note(1) Permanent damage may occur to the LCD module if you operate beyond this specification. Functional operation should be restricted to the conditions which described under normal operating conditions.
Note(2) Ta =25±2℃

3.0 Electrical Specifications

3.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LCD Drive Voltage	VDD	3	3.3	3.6	V	
Current of power supply	IDD	--	333	500	mA	VDD=3.3V White pattern

Note(1) The supply voltage is measured and specified at the interface connector of LCM.
Note(2) Inrush current test circuit and rising time setting (power on)

3.2 Signal Electrical Characteristics for LVDS Receiver

(V15D=V15D_RX=1.5V, VDDI=VDDI1=3.0 to 3.6V, VSSI=VSSRX=VSS_PWR=VSSA=0V)

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Differential input high threshold voltage	R_{xVTH}			0.1	V	RxVCM = 1.2V
Differential input low threshold voltage	R_{xVTL}	-0.1			V	
Input voltage range (singled-end)	R_{xVIN}	0		VDD-1.2	V	
Differential input common mode voltage	R_{xVCM}	0.8	1.2	1.4	V	
Differential input voltage	$\lvert V_{ID} \rvert$	> R_{xVT}	0.4	0.6	V	Note: $R_{xVT} = \lvert R_{xVTH} \rvert$ or $\lvert R_{xVTL} \rvert$
Differential input leakage current	RV_{xliz}	-10		10	uA	
Digital Operating Current	I_{VDD}		(TBD)		mA	FCLK=80 MHz , V15D_RX=1.5V, Data pattern=FF/H
Digital Stand-by Current	I_{STBD}	-	-	(TBD)	uA	RSTB=0 or STBYB=0, Clock & all functions are stopped.

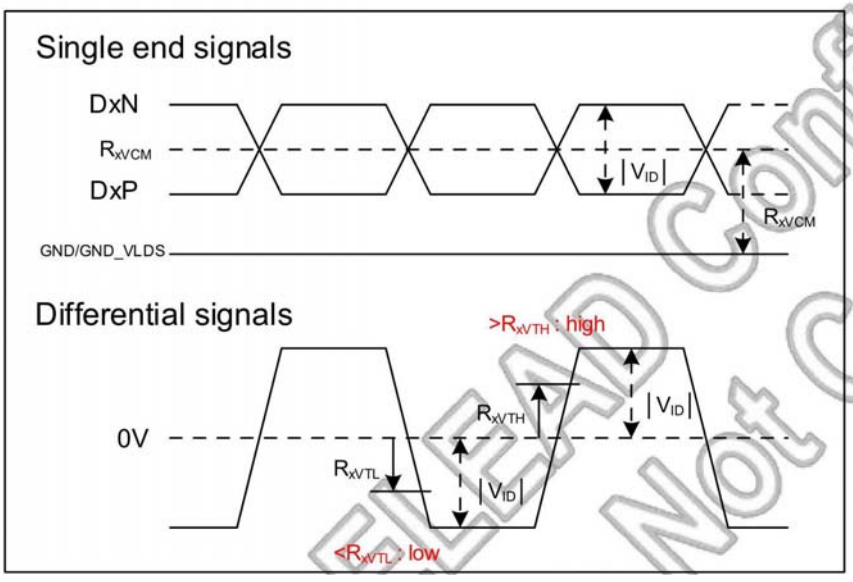
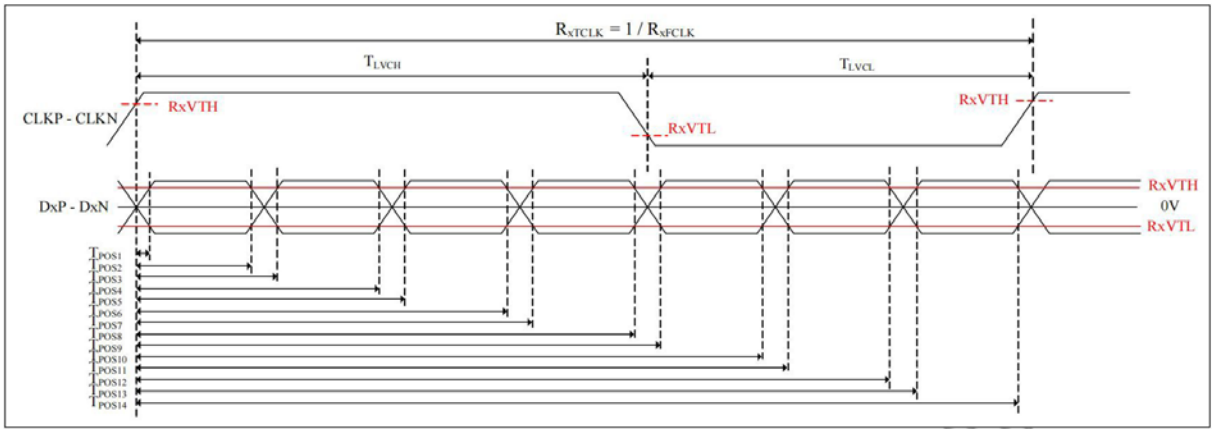


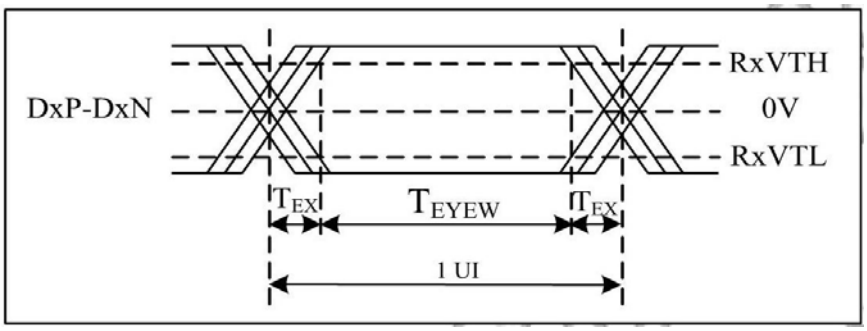
Figure 8 Voltage Definitions

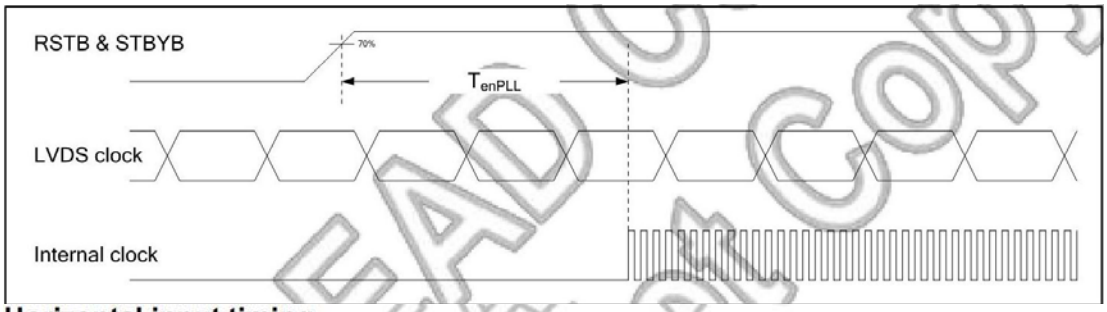
AC Electrical Characteristics

(V15D=V15D_RX=1.5V, VDDI=VDDI1=3.0 to 3.6V, VSSI=VSSRX=VSS_PWR=VSSA=0V)

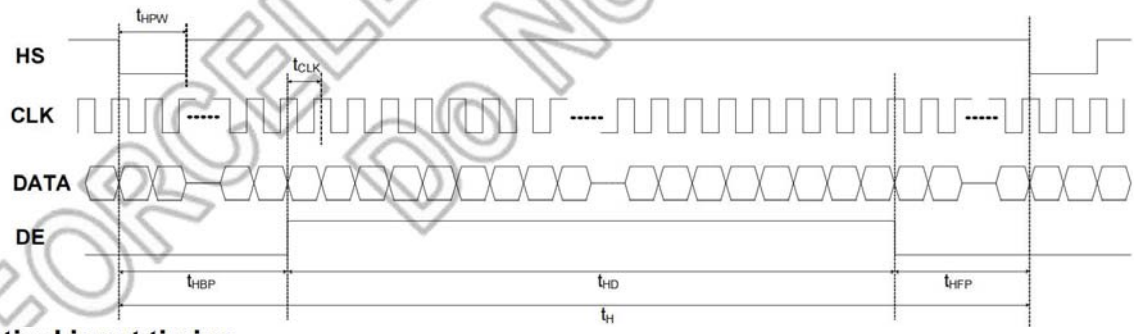
Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Clock Frequency	R_{xFCLK}	20		90	MHz	Max. 90MHz/ port for dual port LVDS. Max. 100MHz for single port LVDS.
Clock Period	R_{xTCLK}	11.1		50	ns	Min. 11.1ns/ port for dual port LVDS. Min. 10ns for single port LVDS.
1 data bit time	UI	-	1/7	-	R_{xTCLK}	
Clock high time	T_{LVCH}		4		UI	
Clock low time	T_{LVCL}		3		UI	
Position 1	T_{POS1}	-0.25	0	0.25	UI	
Position 2	T_{POS2}	0.75	-	1.25	UI	
Position 3	T_{POS3}	0.75	1	1.25	UI	
Position 4	T_{POS4}	1.75	-	2.25	UI	
Position 5	T_{POS5}	1.75	2	2.25	UI	
Position 6	T_{POS6}	2.75	-	3.25	UI	
Position 7	T_{POS7}	2.75	3	3.25	UI	
Position 8	T_{POS8}	3.75	-	4.25	UI	
Position 9	T_{POS9}	3.75	4	4.25	UI	
Position 10	T_{POS10}	4.75	-	5.25	UI	
Position 11	T_{POS11}	4.75	5	5.25	UI	
Position 12	T_{POS12}	5.75	-	6.25	UI	
Position 13	T_{POS13}	5.75	6	6.25	UI	
Position 14	T_{POS14}	6.75	-	7.25	UI	
Input eye width	T_{EYEW}	0.5	-	-	UI	
Input eye border	T_{EX}	-	-	0.25	UI	
PLL wake-up time	TenPLL			150	us	



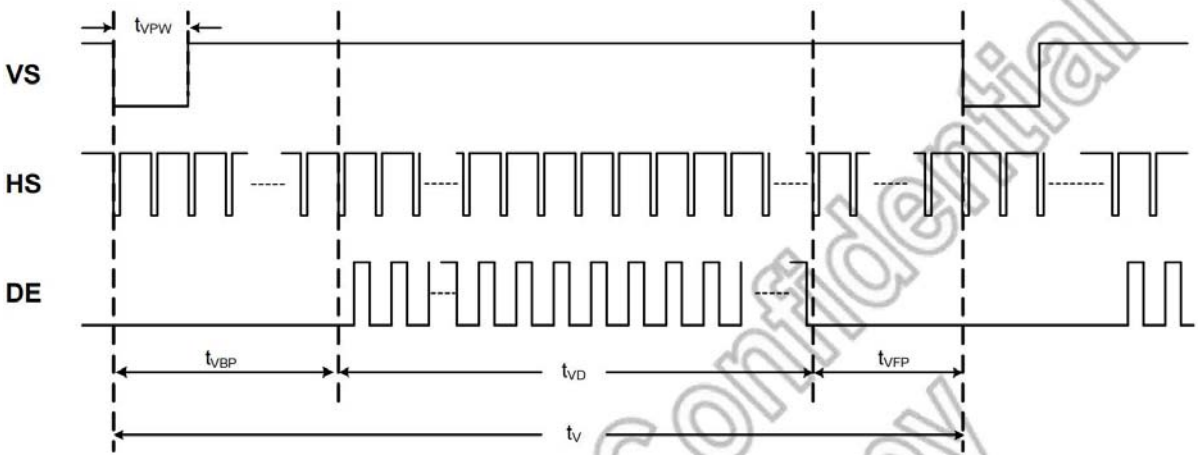




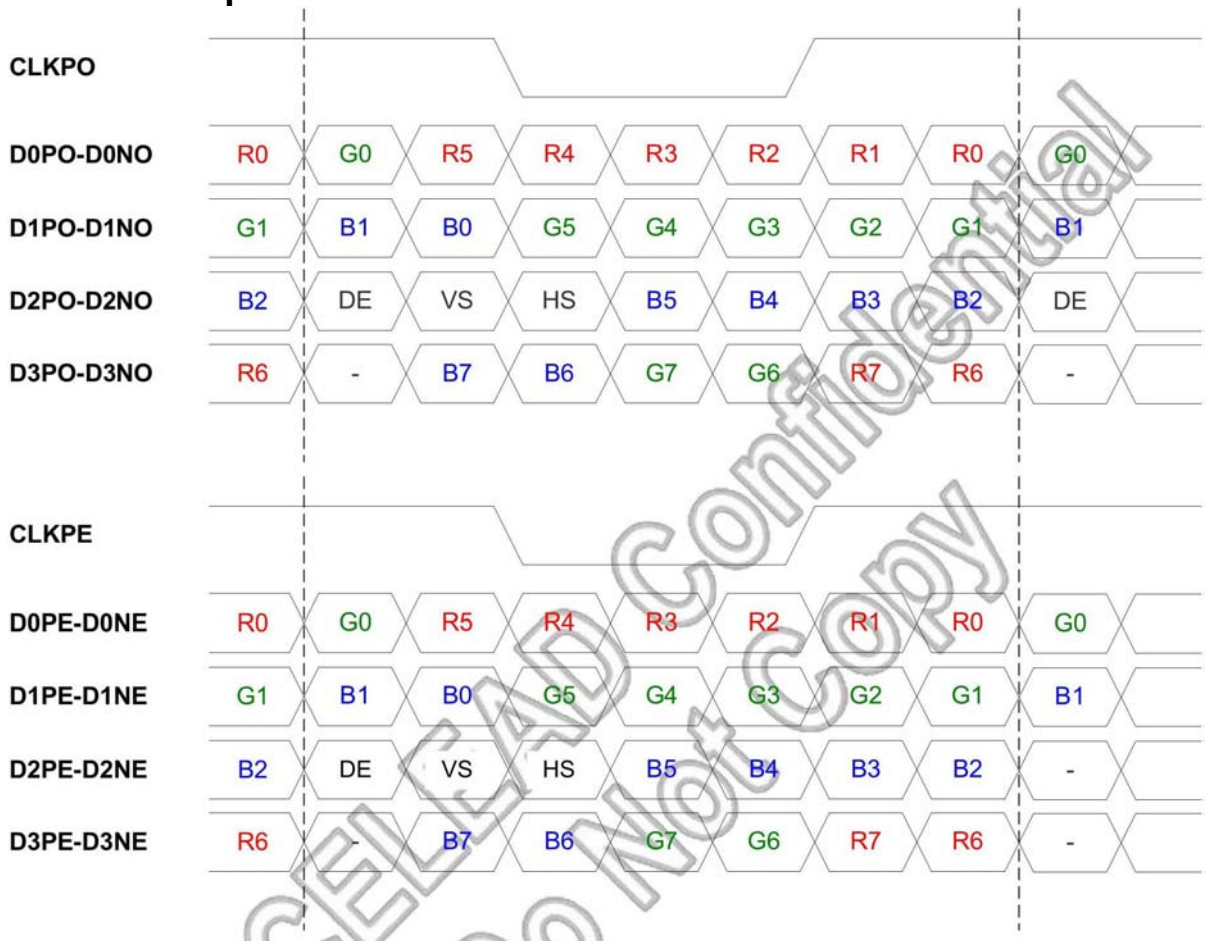
Horizontal input timing



Vertical input timing



LVDS Data Input Format



Note:

1. For 6 bit mode, MSB are R/G/B[5] and LSB are R/G/B[0]
2. For 8 bit mode, MSB are R/G/B[7] and LSB are R/G/B[0]
3. For single port LVDS only ODD port (CLKxO and DxxO) are used

3.4 LED Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V_L	23.4	27	30.6	V	Note 1
Current for LED Backlight	I_L	-	360	-	mA	
LED life time	-	30,000	-	-	Hr	Note 2

Note 1: V_L=27V, I_L=360mA (Backlight circuit: 9 series connection, 4 parallel connection), the ambient temperature is 25℃.

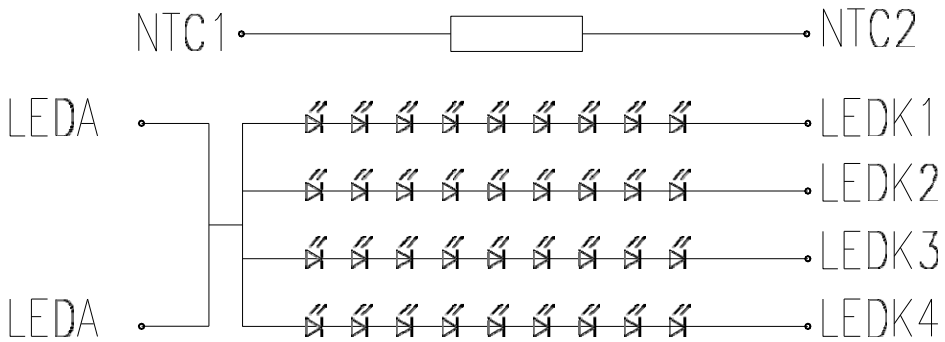
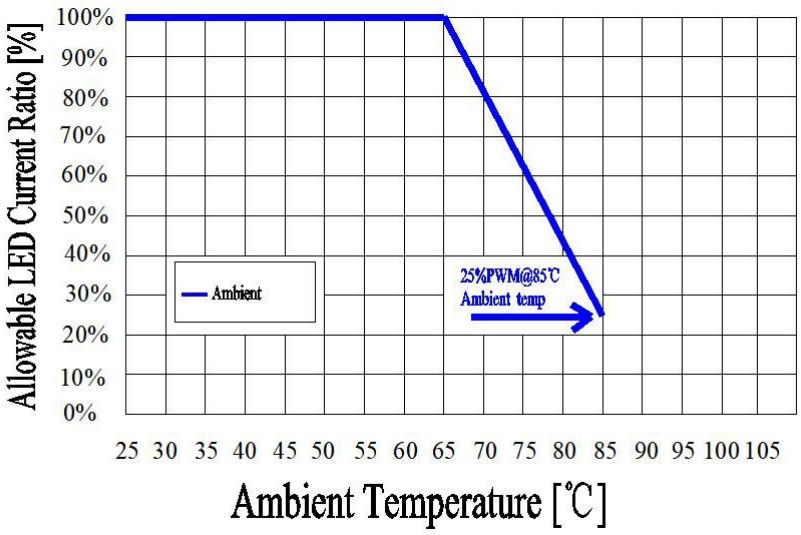


Fig. 4-1 LED test circuit diagram

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and 1/2 rated current. The LED lifetime could be decreased if operating IL is larger than 360 mA

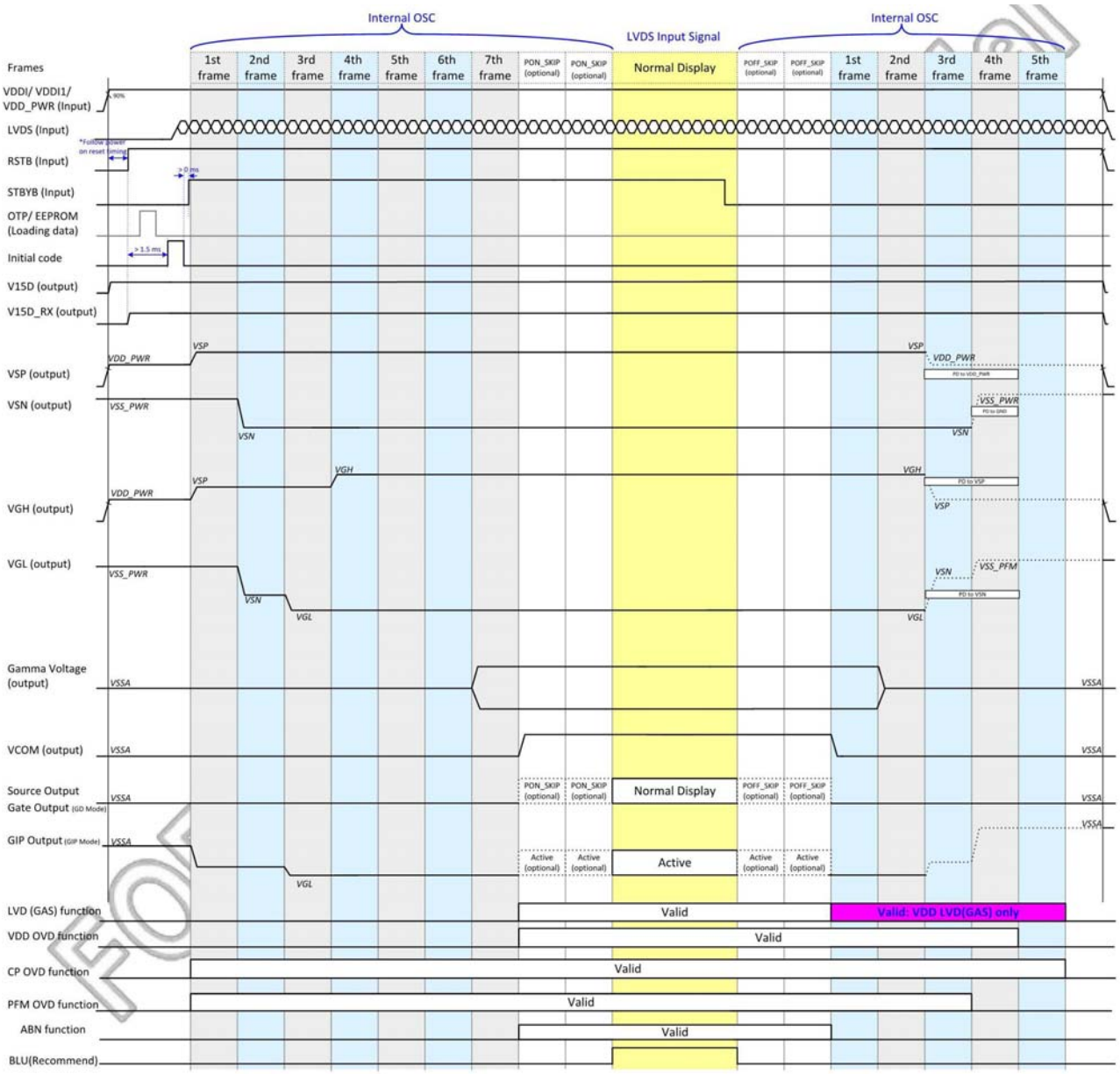


4.0 Timing Specifications

4.1 Interface Timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
CLK frequency	t_{CLK}	86.3	87.7	100.0	Mhz
Horizontal display area	t_{HD}		1920		t_{CLK}
Horizontal pulse width	t_{HPW}	4	12	253	t_{CLK}
Horizontal back porch	t_{HBP}	5	16	255	t_{CLK}
Horizontal front porch	t_{HFP}	50	50	245	t_{CLK}
Horizontal period	t_H	1975	1986	2496	t_{CLK}
Vertical display area	t_{VD}		720		t_H
Vertical pulse width	t_{VPW}	1	3	98	t_H
Vertical back porch	t_{VBP}	4	8	100	t_H
Vertical front porch	t_{VFP}	4	8	106	t_H
Vertical period	t_V	728	736	756	t_H
Frame rate	FR	60	60	60	Hz

4.2 Power ON/OFF Sequence



5.0 Optical Specifications

The optical characteristics are measured under stable conditions as following notes

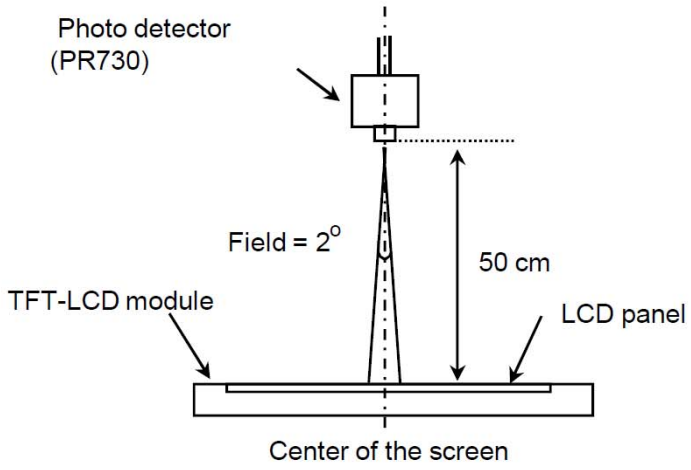
Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle （CR>10）	Horizontal	θ_L	80	85	-	degree	Note1
		θ_R	80	85	-		
	Vertical	θ_T	80	85	-		
		θ_B	80	85	-		
Contrast Ratio	Center		1100	1300	-	-	Note2
Response Time	Rising + Falling		-	20	30	ms	Note5
Color Chromaticity (CIE1931)	Red	x	Typ. -0.05	TBD	Typ. +0.05	-	Note3
	Red	y		TBD		-	
	Green	x		TBD		-	
	Green	y		TBD		-	
	Blue	x		TBD		-	
	Blue	y		TBD		-	
	White	x		0.34		-	
	White	y		0.35		-	
NTSC	-		70	75	-	%	Note3
White Luminance	Center		950	1050	-	cd/m^2	Note4
Luminance Uniformity	9Points		75	80	-	%	Note4

Note(1) Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see Figure1).

Note(2) Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state (see Figure1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / Luminance when displaying a black raster.

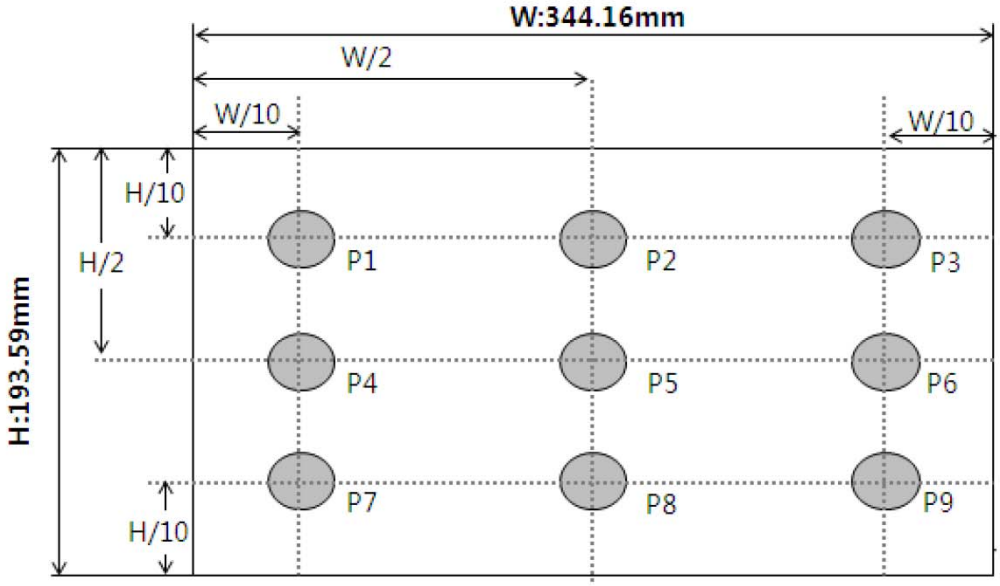
Note(3) Reference only / Standard Front Surface Treatment Measured with green cover glass. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

Figure 1. Measurement Set Up



Optical characteristics measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (9 points)



Center Luminance of white is defined as luminance values of center 9 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

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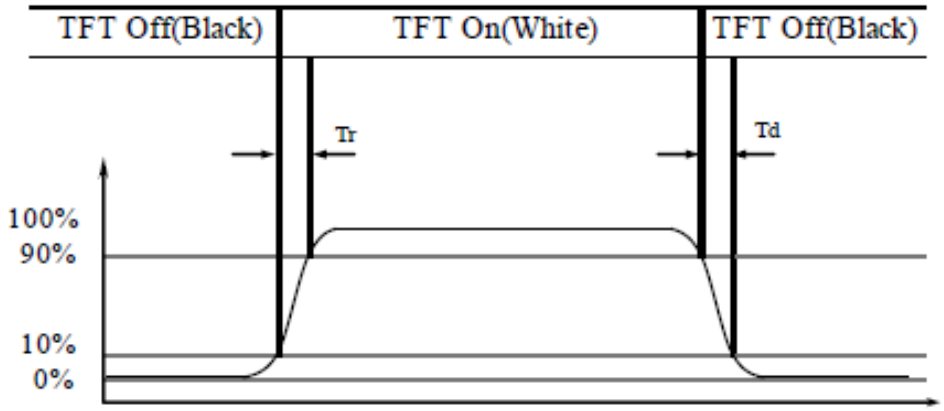
Figure 3. Response Time Testing



Note 5.
The electro-optical response time measurements shall be made as Figure 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

6.0 Interface Connections

6.1 Electrical Interface Connector: JUSTCONN/101049-205050

Pin #	Signal Name	Description
1	GND	Ground
2	TP_RST	TP Reset pin (No connection)
3	TP_INT	TP Interrupt (No connection)
4	TP_I2C_SCL	TP High speed interface CLOCK differential signal input pins.(No connection)
5	TP_I2C_SDA	TP serial data input/output bi-direction pin (No connection)
6	TP_VDD(3.3V)	Power supply (No connection)
7	NC	No connection
8	GND	Ground
9	LVDS_D0P	+LVDS Differential Data Input
10	LVDS_D0N	-LVDS Differential Data Input
11	GND	Ground
12	LVDS_D1P	+LVDS Differential Data Input
13	LVDS_D1N	-LVDS Differential Data Input
14	GND	Ground
15	LVDS_D2P	+LVDS Differential Data Input
16	LVDS_D2N	-LVDS Differential Data Input
17	GND	Ground
18	LVDS_CLK0P	+LVDS Differential Clock Input
19	LVDS_CLK0N	-LVDS Differential Clock Input
20	GND	Ground
21	LVDS_D3P	+LVDS Differential Data Input
22	LVDS_D3N	-LVDS Differential Data Input
23	GND	Ground
24	NC	No connection
25	VDD(3.3V)	Power supply
26	VDD(3.3V)	Power supply
27	VDD(3.3V)	Power supply
28	DP_I2C_SCL	Serial communication data input.
29	DP_I2C_SDA	Serial communication clock input.
30	BIST	Enable built-in self test (BIST) function

		BISTEN=H, BIST mode BISTEN=L, Normal mode (Default)
31	NC	No connect.
32	TB	Vertical shift direction (Gate output) selection.TB function is the hardware setting“XOR” with register setting when FCS=L.) H：Forward,Top-Bottom (Default) L：Reverse,Bottom-Top
33	STBYB	Standby mode. STBYB=H : normal (Default), STBYB=L: standby mode.
34	FAIL_DET	Fail detection signal output Normal = H , Abnormal = L
35	LCD_RST	Global reset pin. Active low to enter reset state. Keep VDD during operation.Normally pull high.
36	RL	Horizontal shift direction (Source output) selection. H: Left - Right (Default); L: Right - Left.
37	NC	No connection
38	LEDA	Power Supply For LED Backlight Anode Input
39	LEDA	Power Supply For LED Backlight Anode Input
40	NC	No connection
41	NTC1	NTC PIN
42	NTC2	NTC PIN
43	NC	No connection
44	LEDK1	Power Supply For LED Backlight Cathode Input
45	LEDK2	Power Supply For LED Backlight Cathode Input
46	LEDK3	Power Supply For LED Backlight Cathode Input
47	LEDK4	Power Supply For LED Backlight Cathode Input
48	NC	No connection
49	GND	Ground
50	GND	Ground

7.0 Reliability Test

The reliability test items and its conditions are shown below.

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C , t=240 hrs	
Low Temperature Operation	-30±3°C , t=240 hrs	
High Temperature Storage	90±3°C , t=240 hrs	1,2
Low Temperature Storage	-40±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	+60°C, 90% RH , 240 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 8~33.3 Hz/1min Amplitude : 1.3mm Test direction : X.Y.Z/3 axes Duration : 15 min/each axis	2

Note(1) Condensation of water is not permitted on the module.

Note(2) The module should be inspected after 1 hour storage in normal conditions (15-35°C, 45-65%RH).

Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

Note(4) All reliability tests should be done without the protective film.

Definitions of life end point:

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

8.0General Precaution

8.1 Disassembling or Modification

(1) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AMPIRE does not warrant the module, if customers disassemble or modify the module.

8.2 Breakage of LCD Panel

(1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
(2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
(3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
Handle carefully with chips of glass that may cause injury, when the glass is broken.

8.3 Electric Shock

(1) Disconnect power supply before handling LCD module.
(2) Do not pull or fold the LED cable.
(3) Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

8.4 Absolute Maximum Ratings and Power Protection Circuit

(1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
(2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
(3) It's recommended to employ protection circuit for power supply.

8.5 Operation

(1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
(2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
(3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

(4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
(5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

8.6 Mechanism

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

8.7 Static Electricity

(1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
(2) Because LCD modules use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

8.8 Strong Light Exposure

(1) The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

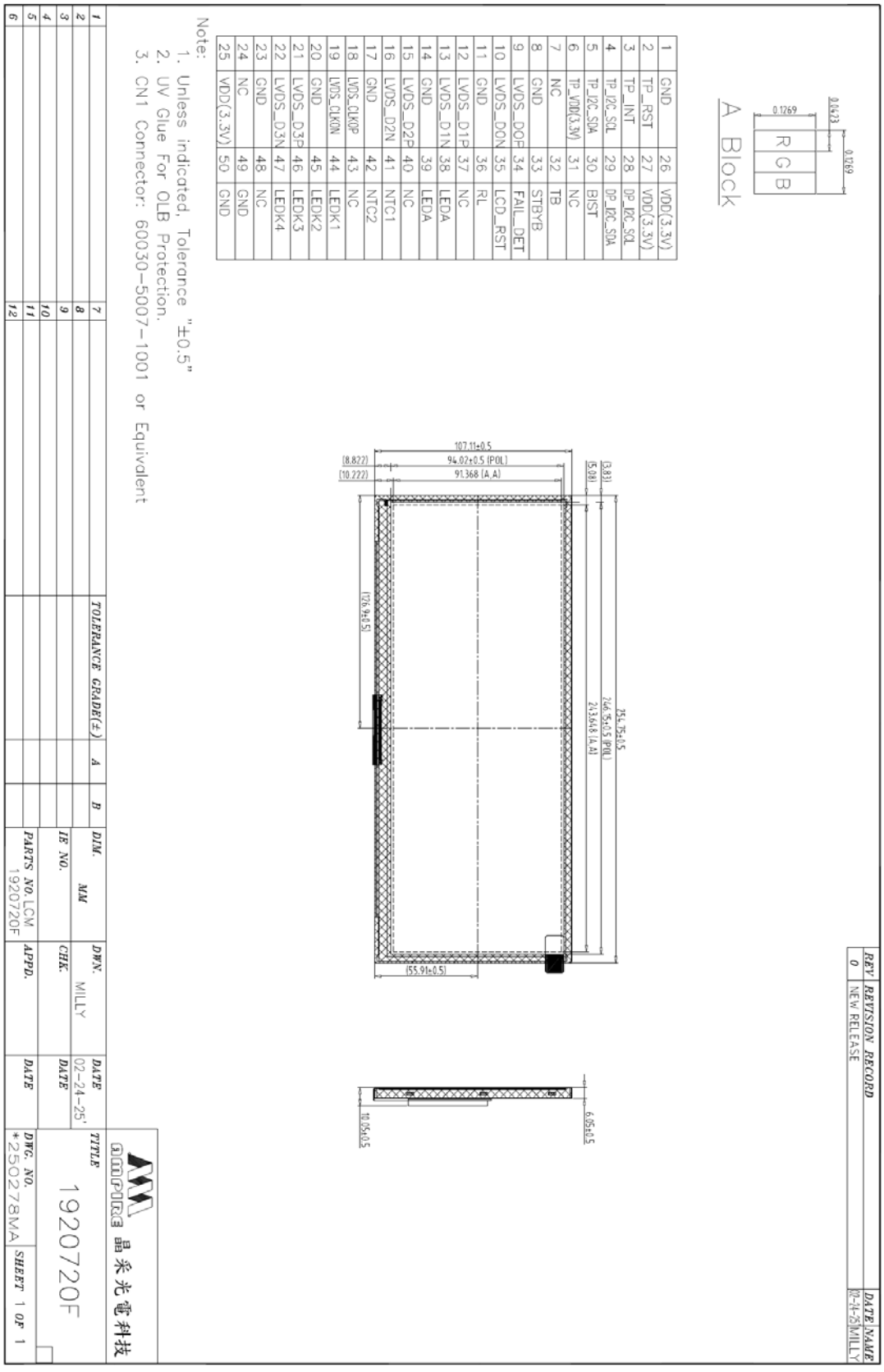
8.9 Disposal

(1) When disposing LCD module, obey the local environmental regulations.

8.10 Others

(1) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
(2) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

9.0 Outline Dimension



1	GND	26	VDD(3.3V)
2	TP_RST	27	VDD(3.3V)
3	TP_INT	28	DP_I2C_SCL
4	TP_I2C_SCL	29	DP_I2C_SDA
5	TP_I2C_SDA	30	BIST
6	TP_VDD(3.3V)	31	NC
7	NC	32	TB
8	GND	33	STBYB
9	LVDS_DOF	34	FAIL_DET
10	LVDS_DON	35	LCD_RST
11	GND	36	RL
12	LVDS_D1P	37	NC
13	LVDS_D1N	38	LEDA
14	GND	39	LEDA
15	LVDS_D2P	40	NC
16	LVDS_D2N	41	NTC1
17	GND	42	NTC2
18	LVDS_CLK0P	43	NC
19	LVDS_CLK0N	44	LEDK1
20	GND	45	LEDK2
21	LVDS_D3P	46	LEDK3
22	LVDS_D3N	47	LEDK4
23	GND	48	NC
24	NC	49	GND
25	VDD(3.3V)	50	GND

REV	REVISION RECORD	DATE	NAME
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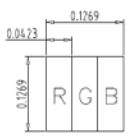
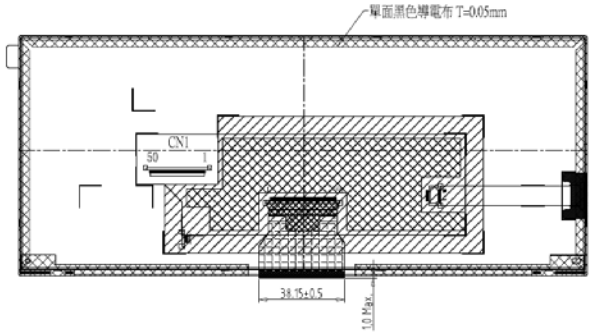


A Block

1	GND	26	VDD(3.3V)
2	TP_RST	27	VDD(3.3V)
3	TP_INT	28	DP_I2C_SCL
4	TP_I2C_SCL	29	DP_I2C_SDA
5	TP_I2C_SDA	30	BIST
6	TP_VDD(3.3V)	31	NC
7	NC	32	TB
8	GND	33	STBYB
9	LVDS_D0P	34	FAIL_DET
10	LVDS_D0N	35	LCD_RST
11	GND	36	RL
12	LVDS_D1P	37	NC
13	LVDS_D1N	38	LEDA
14	GND	39	LEDA
15	LVDS_D2P	40	NC
16	LVDS_D2N	41	NTC1
17	GND	42	NTC2
18	LVDS_CLK0P	43	NC
19	LVDS_CLK0N	44	LEDK1
20	GND	45	LEDK2
21	LVDS_D3P	46	LEDK3
22	LVDS_D3N	47	LEDK4
23	GND	48	NC
24	NC	49	GND
25	VDD(3.3V)	50	GND



Back View

Note:
1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. CN1 Connector: 60030-5007-1001 or Equivalent

1		7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. MILLY	DATE 02-24-25'	TITLE 1920720F
2		8								
3		9					IE NO.	CHK.	DATE	
4		10								
5		11					PARTS NO LCM-1 1920720F	APPD.	DATE	DWG. NO. *250279MA / SHEET 1 OF 1
6		12								

晶采光電科技